

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVED DRY CLEANING PROCESS AND APPARATUS THEREFOR

- (71) We, FREDERICK JAMES DEWHIRST and THOMAS MIDDLETON GILMOUR DEWHIRST, both British subjects and both of 28-30 Wellgate, Lanark, Scotland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 This invention relates to improved dry cleaning processes and apparatus therefor. Dry cleaning processes at present in use employ combinations of degreasing solvents, soap detergents and water for the treatment of soiled articles. The articles are placed in a cylindrical cleaning compartment, which may be of rotary drum or tumbler type or alternatively the paddle type, with the solvent-detergent solution being introduced into the cylinder.
- 15 The conventional dry cleaning processes include those known as the Batch System and the Charge System both of which have several possible variations. For example, one process involves the use of solvent and detergent to assist in the removing of stains, whilst another utilises a detergent/water mixture which is in the form of an emulsion and yet another process involves the application of constant amount of solvent/detergent solution with a carefully controlled amount of moisture or steam introduced into said solution.
- 20 These currently used processes possess however several serious disadvantages which are as follows:—
- (1) A certain amount of pre-treatment of soiled articles is required. Known as pre-spotting, this pre-treatment is in fact the prior preparation of stains by hand before placing the articles in the cleaning cylinder. The pre-spotting treatment is essential if stains are to be removed efficiently by the treatment within the cylinder.
- 25 (2) In a similar manner a certain amount of after-treatment is very often required. This treatment, known as after-spotting, can be manual removal of obstinate stains by further chemical treatment followed by water rinsing or treatment by steam gunning, i.e. the application to the stain of a pressurised jet of steam from a hand gun.
- 30 (3) The solvents and detergents used are costly and have to be used in considerable amounts, which added to the high cost of labour makes the cleaning process quite expensive.
- (4) A risk of damage to the articles being cleaned is always present and as a result, dry cleaners have to incur high insurance premiums in order to cover themselves against claims. Typical damage to garments includes shrinkage, colour bleeding, colour loss and distortion. Regarding colour loss, a particularly severe and common cause of damage can be caused by uncontrolled mixing of solvent spirit and detergent with water.
- 35 According to the invention a dry cleaning process comprises the steps of introducing textile articles to be cleaned into a rotatable cleaning chamber of a cleaning cylinder, rotating the cleaning chamber, introducing steam or atomised water and solvent/detergent/water medium into the chamber through a nozzle or atomiser, said steam or atomised water being directed on to the articles to moisten them and said solvent/detergent/water medium in atomised form being sprayed on to the moistened articles in a controlled amount at a temperature between ambient and 140°F.
- 40 The steam may be applied to the soiled article at a pressure in the range 20-120 lbs./sq.inch and at a temperature in the range 60-350°F.
- The atomised water may be applied to the soiled article at a pressure in the range 50-300 lbs./sq.inch and at a temperature between that of the ambient surroundings and boiling point.
- 45 The solvent/detergent/water medium is sprayed on to the moistened articles at a temperature between ambient and 140°F. Further preferably, the soiled articles are treated by steam or atomised water and

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then by the solvent/detergent/water medium in a cleaning compartment or cylinder maintained at atmospheric pressure.

The period of steam or water injection is determined by the state of soiling of the articles and the weight of the load in the cylinder.

A final injection of moisture may be made into the cleaning compartment depending on the humidity state of the solvent system.

The present invention also includes apparatus for performing the process of dry cleaning textile articles in which a cleaning cylinder comprises a cylindrical casing, a rotary cage within the casing forming a cleaning chamber, means for rotating the cage, a single atomiser or nozzle means for introducing steam or atomised water and a controlled amount of solvent/detergent/water medium in atomised form at a predetermined temperature and pressure into the chamber directly on to the articles to be cleaned and means for controlling the introduction of the steam or atomised water and solvent/detergent/water medium.

The cleaning cylinder may be of the tumbler or paddle type.

Embodiments of the invention will now be described, simply by way of example and with reference to the accompanying drawings, in which:—

Fig. 1 is a schematic representation of the layout of apparatus for performing the invention;

Fig. 2 is a sectional view through the cleaning cylinder included in the apparatus of Fig. 1.

Referring to the drawings the preferred embodiment of the invention is directed to a dry cleaning process on the Charge System principle and utilises a cleaning cylinder comprising a cylindrical casing 1 containing cleaning medium and a rotating drum or tumbler cylinder which constitutes a cleaning chamber 2 which is rotatable about a horizontal axis 3 and is about 39 inches in diameter and 19 inches in depth.

Cleaning medium, which comprises solvent/detergent/water medium and steam or water are supplied to the cleaning chamber 2 from separate sources. Steam is supplied from a boiler (not shown) in pressurised or vacuum conditions using a vacuum chamber.

A steam nozzle or water atomiser 4 is mounted on the cleaning cylinder 1 to direct a jet of steam or atomised water into the rotating cleaning chamber 2. The atomiser may be of simple design, e.g. one of the same design as an oil fuel spray jet, will suffice.

A passageway 5 for carrying cleaning medium from a supply source is provided on the cleaning cylinder 1 and has an orifice 6 opening into the cleaning cylinder to

direct the cleaning medium into the cleaning chamber.

The jet 4 is mounted within the orifice 6 and connected to a duct 7 mounted within the passageway 5 and carries pressurised steam or water.

The jet 4 is positioned in the orifice 6 at an angle L of between 15°—45° from the horizontal axis 3 and on a vertical axis of the rotary cleaning chamber 2 so as to direct a jet of steam or atomised water into the cleaning chamber 2. The head of the jet 4 positioned in the orifice 6 provides an annular opening in the orifice 6 and breaks up the stream of solvent/detergent/water medium which is ejected from the passageway 5 into the cleaning chamber in the form of a spray. The steam or water is supplied to the jet 4 and the solvent/detergent/water medium to the orifice 6 from their supply source through a flow system illustrated schematically in Fig. 1 as incorporating air, electrically, mechanically, magnetically or electronically controlled valves V₁—V₅, check valves V₆, V₇, steam traps ST₁, ST₂, circuit timer T for cyclically controlling the flow system and alarm or cut-out A for system protection and a steam condenser tank C.

The significant feature of the preferred embodiment of the process is that soiled articles within the tumbler or cleaning chamber 2 are treated by first subjecting the articles to the action of a jet of steam or atomised water before being treated by standard degreasing solvents with or without detergents as used in the dry cleaning industry, which may or may not contain water added under carefully controlled conditions hereinafter referred to as solvent/detergent/water medium.

The steam need not necessarily be supplied under a very high pressure, a range of 20—120 lbs./sq.inch is preferred although this may be greater. The pressure within the cleaning cylinder is preferably atmospheric although it is envisaged that a slight vacuum might be applied to the cylinder.

As aforesaid, and in contrast to current practice, the steam jet is applied directly onto the soiled articles in the cleaning cylinder. The steam temperature is preferably in the range 60°F to 350°F when the room temperature is 45 to 65°F, but higher steam temperatures may be employed.

The steam is injected by means of the jet 4 for a period of time which is dependent on the weight of the load and also the condition of the soiled articles. For example, the steam injection period may vary from a few seconds for a small load of 20 lbs. in a not too soiled condition to two or three minutes for a heavy load of 150 lbs. in extremely soiled condition.

After the steam injection has been ter-

minated and with the cleaning cylinder still rotating, the articles are then subjected to the action of a solvent/detergent/water medium which is also sprayed on to the articles by way of the annular orifice formed by the head of the jet 4. The solvent/detergent/water medium is injected at temperatures varying from room temperature to 140°F, the actual temperature employed depending on the material of the articles and the degree of soiling.

The degreasing solvents utilised are of standard type used in the dry cleaning industry, e.g. white spirit, trichloroethylene, perchloroethylene or "valclene" (Registered Trade Mark) which is a proprietary fluoride preparation.

The success of the process of the invention stems from the fact that a large percentage of stains are water soluble and so are wetted out or dissolved by the initial injection of steam onto the articles within the cylinder. Even if the stains contain fats or oils and are not water soluble, the atomised steam acts on them to emulsify them by a wetting out action and places them in a state whereby their surface tension is reduced and so they are more readily absorbed by the electrolytical or chemical action of the solvent/detergent/water medium. Consequently, considerably reduced amounts of the expensive solvents and detergents are required.

As stated above, the solvent/detergent/water medium is injected into the cylinder after a period of steam injection considered to be adequate for the steam to have had the desired effect. A typical run is twenty seconds steam followed by solvent/detergent/water medium for several minutes.

A final treatment may be employed if called for by the humidity state of the solvent system and this entails a further injection of moisture into the cylinder to give further moisture control of the solvent to a predetermined setting.

In a modified form of the process of the invention, water is sprayed onto the soiled garments initially instead of steam. The water is injected as a fine spray through the jet 4 at a pressure in the range 50—300 lbs./sq.inch and at a temperature varying between room temperature and boiling point. The water atomisation is effected with jet sizes of $\frac{1}{16}$ th to $\frac{1}{8}$ th inches in diameter. At a pressure of 50 lbs./sq.inch and using a 60 thou bore, the atomised droplets are approximately 10—300 microns in diameter. At a pressure of 100 lbs./sq.inch and using the same size of bore the size range is 10—30 microns in diameter. The minimum droplet diameter is 10 microns even at 300 lbs./sq.inch.

The process of the invention is effective for all materials which can be dry cleaned.

A very important aspect of the process of the invention is that it can replace laundering in many cases. Many materials which are laundered at present for reasons of efficiency would be better dry cleaned, e.g. white overalls. Laundering is in fact very hard on such articles and if they could be economically dry cleaned their life would be increased tenfold. In this connection the process of the invention is extremely advantageous because it offers a much greater scouring or cleaning action than presently used processes and is therefore much better for getting rid of acids, body odours and the like and moreover the process of the invention does not take the body out of the articles.

The process is excellent for the treatment of silks and cottons and it eliminates more or less the requirement of extensive manual pre-treatment and scrubbing.

The term cleaning medium refers to solvent/detergent/water medium which is intended to cover solvent, or solvent and detergent, diluted or undiluted with water, as conventionally used in the dry cleaning industry.

WHAT WE CLAIM IS:—

1. A dry cleaning process comprising the steps of introducing textile articles to be cleaned into a rotatable cleaning chamber of a cleaning cylinder, rotating the cleaning chamber, introducing steam or atomised water and solvent/detergent/water medium into the chamber through a nozzle or atomiser, said steam or atomised water being directed on to the articles to moisten them and said solvent/detergent/water medium in atomised form being sprayed on to the moistened articles in a controlled amount at a temperature between ambient and 140°F.

2. A dry cleaning process according to claim 1 in which steam is supplied to the articles at a pressure in the range 20 to 120 lbs. per square inch and at a temperature in the range 60—350°F.

3. A dry cleaning process according to claim 1 in which the atomised water is applied to the articles at a pressure in the range 50—300 lbs. per square inch and at a temperature between that of the ambient surroundings and boiling point.

4. A dry cleaning process according to any of claims 1 to 4 in which the articles are subjected to further treatment by steam or atomised water.

5. Apparatus for performing the process of dry cleaning according to any of the preceding claims in which a cleaning cylinder comprises a cylindrical casing, a rotary cage within the casing forming a cleaning chamber, means for rotating the cage, a single atomiser or nozzle means for introducing steam or atomised water and a controlled

amount of solvent/detergent/water medium in atomised form at a predetermined temperature and pressure into the chamber directly on to the articles to be cleaned and means for controlling the introduction of the steam or atomised water and solvent/detergent/water medium.

6. Apparatus according to claim 5 in which the atomiser is disposed to direct a spray into the cleaning chamber at an angle of between 15°—45° to the axis of the cage and is located on a vertical axis of the casing.

7. Apparatus for performing a dry clean-

ing process substantially as described with reference to and as illustrated in the accompanying drawings. 15

8. A dry cleaning process substantially as described with reference to and as illustrated in the accompanying drawings.

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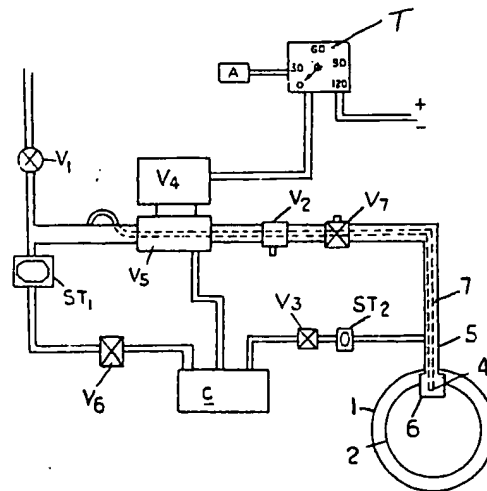


FIG. 1

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Sheet 2

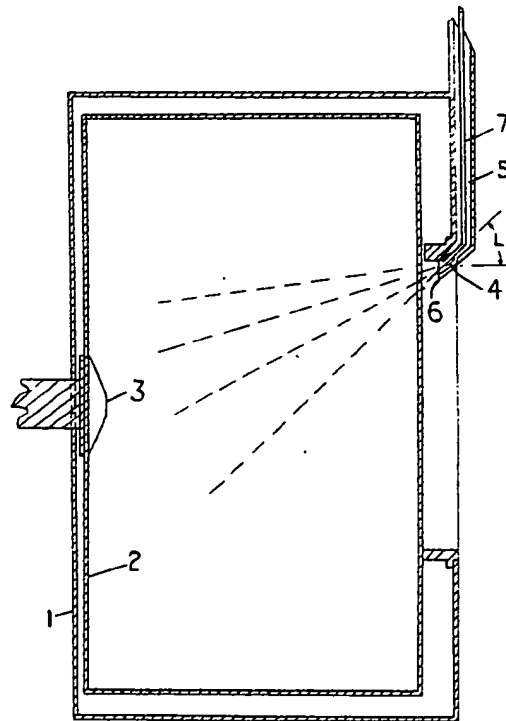


FIG. 2

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